

**Area of Impact: Science and the Environment**

2. (a) Identify *two* processes involved in data logging.

**[2 marks]**

Answers may include:

- physically collecting the data using hardware
- using a computer to collect data through sensors
- analyzing/processing/verifying the data
- saving/storing results
- outputting results
- converting analogue signals to digital.

*Award [1 mark] for any one of the above processes identified up to a maximum of [2 marks].*

(b) Describe *two* other ways that automatic data logging may be used.

[4 marks]

Answers may include:

- weather stations – to capture information about weather conditions (temperature, wind, pressure, humidity)
- medicine – capturing information from sensors attached to patients at ICU
- greenhouses – capturing information about temperature and humidity to actuate and change the conditions
- engine management – collection of data about driving history
- driving patterns – to automatically detect the speed of a car
- stock control using smart shelves – shelves automatically scan the RFID tags in products and alert the store when supplies are getting low
- RFID tags worn by athletes – used for entry to club/finishing positions in races
- RFID tags worn by travellers boarding a plane – used to check the passenger list
- criminals can be tracked through an electronic device worn as a bracelet or belt – using GPS the location of the criminal is found and data is automatically sent to a police control station
- use of RFID tags on products – used to automatically record the prices as customers walk through checkout counters
- use of sound sensors – to capture sound levels in different areas of a building (school/hospital) – to help provide a better work/study/hospital environment
- use of movement sensors to record seismic activity – data is recorded to study patterns and make predictions
- data logging – to monitor seasonal water levels in a river that tends to flood or to determine the rate of increase of water levels and give predictions about flooding
- reading of car number plates – to identify drivers who are breaking speed limits
- tracking tagged wild animals – to study behavioural patterns.

**N.B.** Valid examples of automatic data collection by sensors will be accepted but answers cannot be accepted where data has been manually entered or swiped.

*Award [1 mark] for each use identified up to [2 marks].*

*Award [1 mark] each for the relevant description up to [2 marks].*

- (c) Explain *two* advantages of using automatic data logging to keep records compared with manual data logging.

**[4 marks]**

- Data can be captured 24/7 without the need for people to make measurements.
- Data from automatic logging is exact and no mistakes are made unless equipment is faulty.
- Data is in digital form from the moment it is captured and can be used straight away to produce graphs or statistics.
- Data from data logging can be analysed immediately and results can help prevent disaster.
- Automatic data collection allows for data to be collected faster and more efficiently than manually collecting the information.
- After the initial startup cost, no one has to be paid to collect the data
- Data can be captured in places which are too remote or dangerous for humans e.g. in deserts or on top of a volcano.

**[1 mark]**

*A limited response that indicates very little understanding of the topic.*

**[2-3 marks]**

*A reasonable description of the differences between data captured automatically or manually although the answer may lack appropriate reasoning at the bottom end of the band. [2 marks] for two advantages identified or one advantage described. [3 marks] for two advantages described.*

**[4 marks]**

*A clear, detailed explanation giving reasons why automatic data logging is often preferred to manual data logging.*

- (d) **Information obtained at automatic tolls may also be used to map traffic information and help telecommuters travel on the highways. Some cards may also contain customer's information or an identification number to relate the customer to a record in a driver database for later use.**

**To what extent do the concerns about invasion of drivers' privacy outweigh the advantages of using this system to improve the traffic of cars in a city?**

***[10 marks]***

Concerns about driver's privacy invasion:

- information may be saved to track people *e.g.* politicians, criminals
- information saved may be made available to others
- databases may not have appropriate security, hackers may gain access.

Advantages for improvement of traffic control:

- maps may be produced to understand traffic flow at different times, days
- drivers who use the highways may get information about better ways to plan routes and avoid traffic jams
- information about highways with less traffic may be made available to navigation systems in cars and drivers may chose better routes.

***Please see generic markband information sheet on page 14.***